

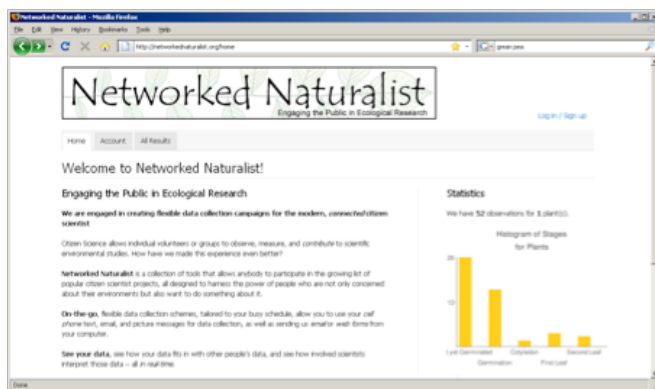
## TEOS 06 Networked Naturalist

### TEOS 06.1 People

- Principal Investigator: Eric Graham
- Faculty: Deborah Estrin.
- Researchers: Eric Graham, Eric Yuen, Nithya Ramanathan
- Graduate Students: Sasank Reddy, Olmo Maldonado
- Undergraduates: Edi Rocha Guerrero, Adam Brenner, Saro Meguerdichian, Guadalupe Hernandez

### TEOS 06.2 Overview

National field campaigns, such as Project BudBurst harness the power of Citizen Scientists to create valuable ecological data for scientific investigations while providing participatory learning experiences for volunteers. Ubiquitous technologies like Internet connectivity, mobile phones, and “Web 2.0” social networks are poised to transform the reach and effectiveness of these campaigns. Networked Naturalist was the first attempt to create a web + mobile data collection system for the CENS collaboration with Project BudBurst. The Networked Naturalist will enhance participation in Project BudBurst by making data collection exciting through immediate text and graphical feedback as well as by expanding the range of methods available for data collection (web, email, mobile phone text and images). Access to expert and peer-based discussions will engage participants, add to their knowledge, and reinforce the community of participating individuals. The overarching goal of The Networked Naturalist is to enhance participatory learning experiences via Citizen Science campaigns and transform the associated learning process.



We wish to increase participation and retention in Citizen Scientist campaigns through three avenues afforded by the use of new technologies:

- Opening the methods for successful data collection, as through the web, email, mobile phones, and automatic data uploads from user-owned hardware.
- Providing immediate feedback on data through automated analysis and real-time display of graphical and map-based representations of participant's data.
- Leveraging the tremendous participation in social networking sites to further enhance the user experience, as well as expand and retain participation.

### TEOS 06.3 Approach

We are creating a robust data collection system to enhance citizen science learning for users, to ensure data quality and improve data submission techniques, transforming Citizen Science campaigns for the digital era.

### TEOS 06.4 System(s) Description and/or Experiments:

Networked Naturalist is an open-source platform to manage Citizen Science data collection campaigns. Our primary goal is to design Networked Naturalist to be easy for anyone to use, and easy for developers to extend.

Networked Naturalist will support the three phases of a Citizen Scientist campaign:

- **Creation** – defining the campaign and recruiting participants
- **Data collection** – participating through easy to use interfaces
- **Data analysis** – processing, compiling, modeling, visualizing and sharing results

Networked Naturalist will need to manage terabytes of data, hundreds-to-thousands of participants, occasional software revisions, and changing data analysis algorithms. These features combined will while support many simultaneous campaigns.

Currently, Networked Naturalist users can:

- Use the website to set up plants that they would like to observe.
- Submit SMS, MMS, and email messages with observations, attached images, and reminder notes on their plants.
- Receive confirmation messages, error messages, or query responses over SMS and email.
- Access, sort, filter, and visualize individual data or everyone's data over a web interface.
- Modify or delete old observations.

### **TEOS 06.5 Accomplishments**

Our pilot campaigns have indicated that campaign organizers and system designers are able to easily and systematically manage all of the entities, system components, and information flow involved in supporting a campaign from start to finish.

Networked Naturalist is extensible, built on top of Code Igniter (<http://codeigniter.com/>), an open source PHP Framework for web applications. Code Igniter uses the Model-View-Controller approach, which allows separation between logic and presentation. The data is stored in a MySQL database which is managed through PHPMyAdmin. By separating data management from the web pages, Networked Naturalist is easier to manage and modify.

### **TEOS 06.6 Future Directions**

We will be newly adopting the system pioneered by Sasank Reddy for incorporation existing web-based services and systems into our data flow.

*Near-Future Capabilities:*

- Protect participant privacy. Sensitive information submitted to the project includes: location coordinates of personal plants; personal login and contact information.
- Include social forums on the website, and a better interface to other social networking sites such as MySpace, Facebook, and Friendster.
- Incorporate GIS visualizations that will draw on external data-streams, from freely available meteorological data to user-uploaded spatial data sets.
- Allow alternative data inputs, such as from personal webcams or from image sharing websites such as Flickr, with some automated analysis of such data.
- Continue with increasing robustness features to save data during crashes and identify faulty inputs.
- Store data in the database with an open API so that anybody can access their own data and “anonymized” versions of others' data using a programmatic interface.

### **TEOS 06.7 External Research Partnerships**

Sandra Henderson at UCAR, lead on Project BudBurst (pending grant proposal, future collaboration is also planned)